

COMPUTERWORLD

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Keypact terminal set up for financial planning

Portable Terminal Solves Life Insurance Problems

ATLANTA — An 8-3/4-lb terminal has been developed for on-the-spot analysis of the major problems that life insurance salesmen are called on to solve in normal solicitations.

The developer, an Atlanta consultant named Bowles, Andrews and Towne, Inc., has designed the Keypact unit to operate in conjunction with a time-shared 360/40.

Typical problems handled include individual insurance needs, premium calculations, investment calculations, and estate settlement (tax) costs.

The terminal kit includes templates designed for easy input of the four types of statistics and for presentation forms. The

salesman sets up the problem using dial settings which allow easy checking prior to transmission. Keypact is said to give quick voice response.

The system is built around a toll-free incoming wide-area telephone service network, allowing 24-hour service to subscribers.

The using company will pay between 50 cents and \$1 per minute of connect time, the company says. This charge will include line, connect, and processing time.

Keypact is going to its first user very soon, the company said. Orders are being accepted for delivery next spring.

The company's address is P.O. Box 80385, Atlanta, Ga. 30341.

Bema Ratifies X3 Reorganization, New Committee to Handle Planning

BERMUDA — The reorganization of the USASI X3 Committee on Data Processing has been ratified by Bema, the committee's sponsor.

In a meeting at Castle Harbor here, Bema approved USASI proposals which set up two full-committee-level groups.

The first, called the International Advisory Committee, has been chartered to handle international standards coordination.

The second, the Standards Planning and Requirements Committee, will take care of the future planning efforts that often bog down a committee dealing with the "now."

The Standards Steering Committee, now out from under the split-off functions, "will therefore be given more freedom to the chief objective, the development of assigned

as," Bema said.

A new document, the Objec-

tives, Organization and Operating Procedures Manual has been published and officially approved by Bema. The purpose of the reorganization is, according to Bema, the overall speeding-up of response to the need for standards in the information-processing area.

This edition of the manual supersedes the previous version reflecting the old X3 organization, published in 1965.

The manual, and the associated committee reorganization, underway since 1967, was the culmination of efforts by over 200 contributors comprising users, the government, producers, and many general-interest groups concerned with data processing standardization.

As part of the reorganization, Bema hopes there will be more user representation on the committees, a Bema spokesman said.

L.A. Court Upholds Right to Sue DP Service for Punitive Damages

LOS ANGELES — A recent ruling from the Los Angeles Superior Court confirms that plaintiffs have a legal right to assert a claim for punitive damages in a suit against a computer service company.

Judge Robert W. Kenny decided May 21 that the Southern California Retailers Credit Service Co. has the legal right to assert a claim for punitive damages against Statistical Tabulating Corp., a large commercial computerized service bureau.

Retailers Credit is claiming punitive damages of \$1 million and total damages of over \$2 million.

Retailers Credit alleges in its complaint that the defendant failed to provide the plaintiff with good computing services, which in turn caused Retailers Credit to lose customers and profits.

In particular, the judge upheld Retailers Credit's right to punitive damages for defendant's failure to deliver the credit company's customer files which were kept on magnetic tape, and to deliver, in accordance with contractual agreement, the program developed by Statistical Tabulating to process these files.

IBM 'Free' Sort Could Ruin Us: Firm Tells Court

NEW YORK, June 1 — Programmatic said in court today that it was not in a financial position to outlast the effects of IBM's current software policies. The firm said it might be completely destroyed unless IBM were forced to charge for its new DOS Sort or to withdraw it.

The firm said that IBM's policy of supplying the sort without charge was threatening much of the market for Programmatic's own proprietary product, PI Sort, because potential customers were waiting to test the new IBM sort before deciding whether to buy PI Sort.

Programmatic is seeking a temporary injunction in Federal District Court to block IBM from distributing and maintaining the sort without charge. The hearing will continue tomorrow.

The IBM sort which Programmatic wants priced or withdrawn is the 483 Sort issued Feb. 1 and reissued with a number of changes in Release 20 in April. However, another IBM sort, the 450 Sort, was featured

Retailers Credit is represented by attorney Warren I. Wolfe of Los Angeles; Statistical Tabulating by attorney Wendell B. Will of Glendale, Calif.

Retailers Credit provides credit service to about 80 retail establishments whereby it buys most of the charge accounts that these retailers have with their charge customers, bills the charge cus-

tomers, and collects the funds from the charge customers.

Statistical Tabulating basically performed the EDP functions of Retailers Credit's business. This consisted largely of sending out the bills to the charge customers, providing an aged list of all accounts receivable, as well as providing other data processing services to the plaintiff.

'Transferability' Is Seen As Next Goal for Codasyl

WASHINGTON, D.C. — Free transference of software and of data between systems should be the next two objectives of the Committee on Data Systems Languages, Robert Bemer told the organization at its 10th anniversary meeting here.

Bemer, of GE's Information Systems Department, stressed the importance of maintaining standards for data compatibility and of maintaining separation of information from the data which contains it. He explained that out of what he estimated to be approximately \$36 billion spent on software to date, much waste could have been eliminated by simplifying the conversion process.

Pointing out that, "If the data is not transferable, the program is not transferable," Bemer expressed some satisfaction with the progress in language transferability.

However, he said, the next \$36 billion worth of software will be produced in far less time than the first \$36 billion, making the program transferability problem critical.

"It's Like a Bomb!"

He compared the problem with that of being locked in a room with a bomb. "It's a combination lock. There's a fellow on the outside who can tell you the complicated procedure necessary to open the lock and you can hear him. Unfortunately, he speaks only Italian and you cannot understand Italian. BANG!"

Bemer proposed separating those elements of language which deal with data handling from those which deal with the logical, or informational, relationships of the data. Each language has been developed along lines based on its particular needs, with no consideration for the needs of other languages, he said. He also touched on the problem resulting when more than one user needs the information contained in a set of data,

but their requirements differ and they use different languages.

Five Language Sections

Bemer proposed that languages should have five distinct sections: information procedure (program logic), data procedure (general data translation), identification, environment, and data structure.

He pointed out that this concept produces a "composite programming language." He requested that languages contain more than one way to describe a particular function, and said that the way selected should be controlled by a "switch" when a program is to be compiled. This idea also would permit the handling of specific needs which are becoming obsolete, such as over-punched signs, he said.

Call for Partitioning

In summarizing, Bemer called for Codasyl to continue the development of language standards, but to remember the needs of data and information when considering the breadth of a standard. He called for the partitioning of Cobol so that only those features involving information processing would be included in that division. The data section would be separate. This would, he pointed out, involve the restandardizing of the existing language standards to reflect this need.

On the Inside

Tab Equipment Still Has Important Role

— Page 9

Credit Reporting Under Scrutiny

— Page 13

Editorials	8
Education	12
Financial	17
New Products	6
Societies	14
Software	15
Viewpoint	9

(Continued on Page 2)



Lawrence Beckreck adjusts the controller on the experimental graphic output terminal during a test of the system.

Analog Graphic Output Found to Reduce Costs

CAMBRIDGE, Mass. — The use of low-cost, analog graphic output can reduce costs for users of CRT terminals with hard-copy devices and can speed processing, according to Lawrence N. Beckreck of Applied Geodata Services, Inc. (AGS).

AGS recently tested a system consisting of a \$1,125 X-Y plotter with a control costing \$2,500 and a \$1,260 oscilloscope. Beckreck said the company was satisfied with the output compared with AGS's present system consisting of a \$4,550 CalComp 565 incremental plotter and an \$8,800 Model 260 controller.

The user thus gets an extra output device (the new controller can handle several devices simultaneously) for about the price of the digital plotter alone, he said.

"It's nice to have a Cadillac,"

said Beckreck, "but we find the qualities of a Chevrolet are quite satisfactory." He noted that the "Cadillac" they have been using is one of the least expensive of its line.

AGS believes the new combination will widen the market for the firm's services. The company currently is introducing a soil-engineering, time-sharing service.

The controller is the TSP-12, from Time Share Peripherals of Wilton, Conn.

Besides cost and speed (the box is factory-tested at 10,000 char/sec, and is limited by the slowest device being used), the new unit offers a number of other features. One is the ability to change origin without going through the software. Another is the ease of attachment (and unhooking) of output cables. TSP has not yet established lease prices for the controller.

Firm Says IBM Actions Are Damaging Its Market

(Continued from Page 1)

during much of the first day's hearing as the judge tried to get a year's education in computer jargon and ambiguity in a few hours.

Importance of 450 sort

The 450 Sort became important because PI Sort replaces one part of it, but continues to use the other parts. This was done, said David Ferguson, Programmatic's president, so that the user could continue to employ his present 450 Sort control cards

and not disturb operations in the computer room at all.

Changed is the main sorting formula for fixed-length records. Programmatic claims an improvement of two times over the sorting times of the 450 Sort for such records.

Voice From the Grave

At one point in the hearing, Richard C. Jones, president of Applied Data Research, quoted the late Ascher Opler, the noted computer authority who was working for IBM when he died last February. Jones said that Opler had told him during the 1968 Fall Joint Computer Conference that the announced, but not delivered, 483 Sort would cause Programmatic to have a "great deal of difficulty" in selling PI Sort. Jones said that the conversation included himself, Opler, and Ferguson.

Jones, discussing the relation between Applied Data Research and Programmatic, explained that although he had been trying to buy Programmatic for some years, he had been consistently turned down by Ferguson until about six weeks ago. At that time Ferguson phoned him and said that he needed immediate financial help. ADR then advanced money on a contingency agreement.

DATA COMMUNICATION IDEAS?

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Here's the answer to branch office data communication, the Tally 1021 Data Terminal. This mag tape unit accepts data from serial or parallel modems, input/output typewriters, card readers and paper tape readers. Data can be transmitted or received at up to 1200 wpm. Parity checking and unattended operation are standard. Hard copy printout is 155 wpm.

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The comprehensive, computer-communications network will combine telephone, computer, television, radio, and graphic information-handling technologies. Among the services that will be available to tenants are high-speed facsimile transmission of documents, data processing, and storage and retrieval on a shared-time basis.

At the core of the whole system will be an electronic central office that will enable tenants to select the computer services they require. For example, the office will be capable of interconnecting the customer's communications and data processing terminals with domestic and international communications equipment and data banks.

Tenants will be able to use computer facilities on a shared-time basis for a host of standard business operations through terminals located in their offices. These operations could include purchasing and inventory control, customer billing, processing of orders, record storage and retrieval, and personnel administration.

The flexibility of time-sharing

will permit users to store their own programs and data for almost instantaneous access. All such material will be security-tight; the computer will require the user's "password" to give access.

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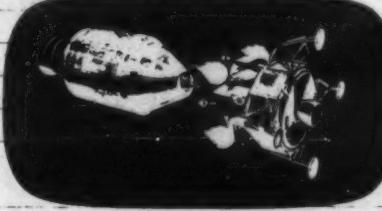
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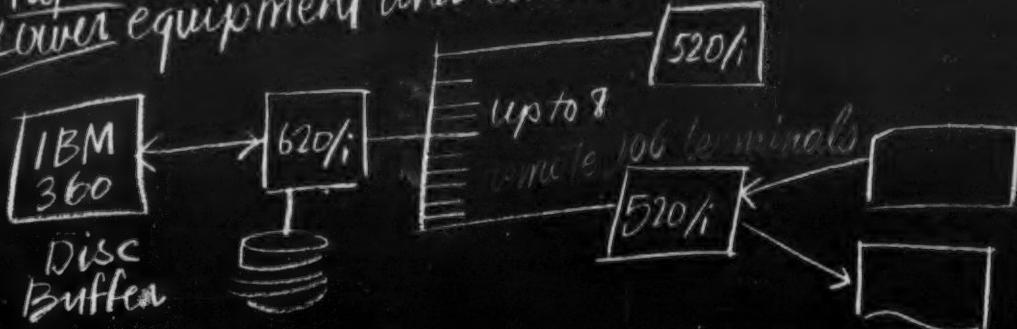
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SPA Membership Applied For

Time-Sharing Service Will Offer APL

CHICAGO — APL (A Programming Language), based on Iverson's Notation, will be the basic language for a new time-sharing service based here in the Midwest. The new company, known as Creative Computers Corp., intends to use APL as the basis for offering consulting and systems design.

The language, featuring extremely simple syntax, conversational response, conciseness, and broad applicability, is felt to be the best offering in this rapidly expanding field of time-sharing, according to Joseph Mill, company president.

Mill, formerly physical-sciences project manager at Science Re-

search Associates (an IBM subsidiary), has been involved with the development of APL for over three years. He feels very strongly that its uses have just begun to be seen.

Also involved with this effort is Dr. Peter Calingaert, coinventor of the IBM S/360, and a long-time supporter of APL.

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Errors Nearly 'Elect' Candidate

By Peter L. Briggs
CW Staff Writer

PHILADELPHIA — James Martin, a candidate for judge in the recent primary election here, was almost "elected" by errors in keypunching which occurred the night of the primary, May 20. According to John J. Naylor, city DP manager, keypunching problems involving the left-zero insertion feature of his IBM 029 keypunches created some unexpected errors.

Naylor told CW that the irregularities in the ballots (there was an "X" placed beside Martin's name due to his removal from, and later reinstatement to, the Republican ticket) had not caused the problem, as had been reported in local papers. Naylor said, "Tuesday night we really didn't know what was happening. We knew where the error was, but we didn't really discover what the error was until much later that night."

The problem involved the fact that in order to use the facilities of the programming drum on the 029, it is necessary to hit the "release" key before punching the first card. When cards had to be corrected, because of key-

punch errors, some of the operators forgot to perform this step. This resulted in the amount for the first and second candidates on each such card being left-rather than right-justified in the four-column field.

Errors Additive

For example, if the first candidate on the card (another candidate for a judgeship by the name of Gurren) received 57 votes, and Martin, the second candidate on the card, received 23 votes, the first eight columns would read "57005723," thus multiplying the error enormously. Most of these errors were discovered as they occurred, but 10 errors, amounting to about 20,000 votes, managed to escape detection until late in the evening.

The unusual results were ob-

served, and a search for the source of the error began very early, but it was not until after midnight that the final errors were discovered. Naylor felt that although any errors were serious, the small number of errors out of the 80,000 cards punched by the 35 keypunch operators, and the fact that the errors did not falsify the end result (Martin still lost by the end of the evening), mitigated the seriousness of the problem.

City Still Happy

Naylor also told *Computerworld* that the election held last November had gone completely without a hitch, and that everyone was satisfied that the problem could be eliminated. He also said, "We certainly are not going to use the left-zero function again! We just can't afford it!"

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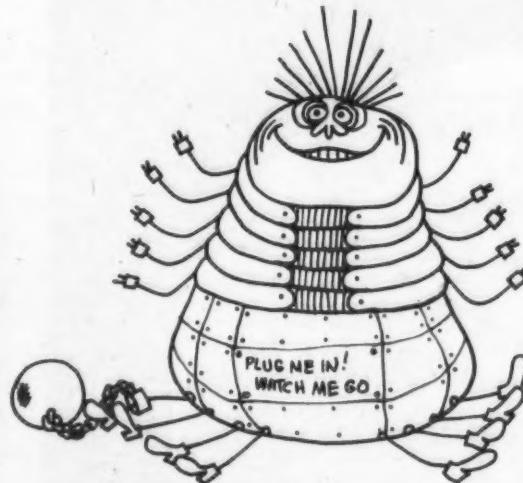
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Bug 5



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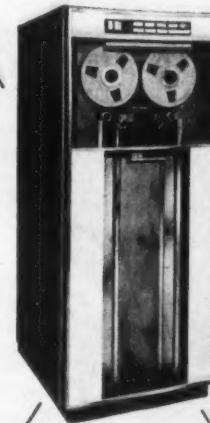
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TOKYO — A charge-card system, which inputs through either a vending machine or a more prosaic register device, has been announced by Omron Tateisi Electronics.

There are various types of applications, served by somewhat different types of input cards. The company foresees future applications such as optical cards to hold static information; magnetic cards with special symbols that can be hardly imitated; credit cards, commuter tickets, and coupons; cards sensed by high-frequency devices; and fluidically sensed cards for applications involving explosion-proof nonelectric devices.

A number of specific applications are pictured in Omron's brochures, such as the vending

machines, automatic cash banking, toll collection, attendance checking (at work?), amusement machines, and public-transit fare collection. Can you imagine a machine telling you that you can't afford to go where you want?

Omron Tateisi Electronics Co. has a sales office at 166 Forbes Road, Braintree, Mass. 02184.

Desk-Top Calculator

Answers to multiplication, division, addition, or subtraction problems appear on the CRT screen of a new desk-top electronic calculator developed by Victor Comptometer Corp.

"The Victor Series 1400, at \$1095, has the same price tag as mechanical rotary calculators but offers businessmen greater

New Products

speed and flexibility, simple operation, and complete silence," according to V. James Ford, marketing vice-president for Victor's Business Machines Group.

The new machine is said to be the only calculator that automatically creates a constant in multiplication and division. Once the multiplicand or divisor is entered, it will stay on the screen for use in subsequent problems.

Answers are automatically rounded off at a choice of eight

settings.

The only moving part on the Series 1400 is a silent keyboard. Learning time is brief due to a simple, logical keyboard layout, the company says. Problems appear in normal mathematical order.

A visible storage register accumulates results providing an automatic grand total of positive and negative extensions. An independent memory stores figures for recall at any time. This amount retains the decimal as entered, and if negative, retains the minus sign.

A constant dividend can be attained by placing the factor in the memory unit for repeated recall at the touch of a key.

Up to 14 clearly visible digits appear in each register of the

nonglare display. For easy readability, all numbers are spaced in groups of three without unnecessary zeroes.

A convenient store key permits simultaneous addition of amounts into the storage register when performing addition.

Victor Comptometer Corp., Business Machines Group, 3900 N. Rockwell St., Chicago, Ill. 60618.

Quiet Terminal

Texas Instruments has announced a terminal which is said



to be quieter and faster than conventional units. The Series 720 Model 10 data terminal uses a monolithic, solid-state printer, which produces characters on thermal-sensitive paper.

The printer operates at up to 400 words/min, as compared to the 100-150 rate offered by conventional units, the company says.

The series is said to provide more efficient utilization of multidrop private lines by allowing twice the number of terminals per line, while still giving full service to each terminal. This is made possible by a self-contained buffer memory with 50-character storage.

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Texas Instruments, Inc., P.O. Box 66027, Houston, Texas 77006.

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The multiplexor is being programmed to reformat and retransmit the data over a high-speed network to Tapewatcher subscribers nationally.

Tapewatcher Computer Corp., 3 Park Row, New York, N.Y. 10038.

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Editorials**Expression of Need**

Rep. William S. Moorhead's recent description of what Congress needs also defines Congress' information problem. "What we need," he said, "is somebody with the capability to respond to Congress, and to say, 'In our opinion the question and the judgment factor is this, or is that.'"

The capability to respond; the capability to locate a question; the capability to locate a judgment factor.

Quite a need. No wonder that Rep. Jack Brooks, who is a practical man now very well versed in the realities of the data processing situation, commented that the project of computerizing Congress is a long-term one, and the thrust is a long way off.

Yet Moorhead's comments should not be underestimated. He stated the need — and the need is genuine. He did not state that the need should be fulfilled by a computer system. He understood that point so clearly that he accepted the role of computers in the provision of this vital service. He also understood that a person would probably also be involved.

The day we can come near to designing the system Moorhead describes is far off. Our attempts nowadays are faltering steps along the way. Yet they are movement, and they are movement in the right direction. Someday soon, someone will make another step forward in this direction.

Hopefully when he does so, someone will recognize it as a step forward and will see that it comes into fruition and gets the support that is needed.

In rounding up support for the right step, he may think of Rep. Moorhead's remarks. For they can be used as a target, or as a test of whether the new idea is really a step forward, and not a step back. They can help us discriminate the useful from the useless, and perhaps from the worse-than-useless.

Computer systems, no less than men, need targets at which to aim. Our thanks to Moorhead for giving us a good — if currently unattainable — target.

Computer Virtues Ignored

Warning that increased computerization will increase errors, Sen. William Proxmire has introduced a bill to regulate credit-reporting agencies, such as credit bureaus. Its provisions are weak, however, and fail to give the consumer the protection he needs.

But the growing computerization may also provide an answer to the problem. Currently, credit files are collections of scraps of paper, and reports are compiled by clerks who read the contents of the file. Thus, reports are usually made by telephone, with no hard copy.

But when files are computerized, hard copy can be produced with little extra difficulty. Thus, it seems reasonable to require credit bureaus to send a copy of every report to the person on whom it's being made.

Other regulations are required to make certain that a person can correct any errors in his file — but no one can correct errors he doesn't know about. Providing information is surely a vital first step.

This should not be limited to credit reporting. A person should receive a copy of any report about him that is based on second-hand information, whether it is a credit report, a school transcript, an insurance investigation, or a newspaper article.

Only first-hand impressions or opinions should be exempt; anything else is open to error or misinterpretation. Thus, personal references would be exempted, but anything based on a file or the reports of other people would be viewed as second-hand.

Many will argue that such a law would render it impractical to make many of the reports now being produced. Then so be it. If it is important enough to get a confidential report on someone, it is also important that the report be balanced and that the person have a chance to give his own version if he disagrees.

Can YOU Stand It?**Letters to the Editor****Konigsford Comments on ACM Question**

There is currently before the members of the ACM a Question of Importance asking whether or not the ACM Constitution should be changed to allow it to take positions on questions of deep social and political significance.

It is unfortunate that we have been asked to vote upon so significant an issue before adequate discussion among the members has ensued. Because of the necessity for more public discussion, I would like to state my feelings about this issue.

The most compelling argument for ACM taking stands on questions that are primarily social or political in nature goes something like this: I am a man. I can not be a whole man if I do not take part in the passions and issues of my day. As a whole man, I can not separate that part of me that is a citizen from that part that is a computer professional. Therefore, ACM should represent me as a whole man.

I enthusiastically endorse this view that one must be a whole person. I call upon all computer professionals to take action on the great issues of the day in accordance with their priorities and ethics. Moreover, while it may be unfair to ask a man who feels his primary obligation is to wife and family to risk his job or jeopardize his chances of promotion, we can ask that he continually probe the limits within which he can operate; and we can ask that he work with us all in trying to create a social climate wherein activities of conscience do not entail threats to one's livelihood.

However, we should also notice that man acts through many institutions — his church, his business, his local government, and many others. Each of these serves the whole man in various, more-or-less specialized ways. What then should be the role of the professional computer society?

I would recommend that the ACM foster vigorous discussion and appropriate action on questions where the membership has a special technical relevance or special knowledge by virtue of our association with computer applications; but that we should leave stands on general social and political issues to other more appropriate institutions.

Let me note that, while there are cases whose nature is difficult to determine, the vast majority

of situations are easily identified as either primarily social/political or primarily technical/professional. An analogy from pattern recognition might be appropriate here. While it is difficult to determine precisely how many hairs make a beard, or precisely when a group of dots first forms the pattern of the letter "A", it is seldom difficult to decide whether a man does or does not have a beard.

I would further support my suggested role for ACM with three additional arguments:

- Many other institutions exist through which we may express ourselves on issues that are primarily social in nature. But, there does not currently exist any large organization which is properly representing us on computer-technical issues, such as the feasibility and cost-effectiveness of the ABM computer system or computer safeguards to privacy in large data base applications. Let's encourage ACM to accept its full professional role.

- If we openly wear the hat of political advocate, those whom we wish to serve will have cause to question our objectivity and accuracy when we wear the hat of technical counsel.

- There are so many compelling problems where our knowledge does have special relevance that we can never begin to competently address all of them. We have not begun to address most of them. Let's get down to business.

I encourage those who are interested in fleshing out the procedural questions or substantive issues associated with the professional role I have suggested for ACM, to contact me at 10 Franklin Ave., White Plains, N.Y., or to contact Robert Bigelow at 39 Grove St., Winchester, Mass.

William L. Konigsford

White Plains, N.Y.

Computerworld welcomes comments from its readers. Preference will be given to letters of 250 words or less. *Computerworld* reserves the right to edit letters for purposes of clarity and brevity. Letters should be addressed to: Editor, Computerworld, 60 Austin St., Newton, Mass. 02160.

Tab Equipment Still Has Important Role in Installations

By Harvey N. Berlent

NEW YORK — Mention of the word "Tab" to most computer-wise EDP managers will often provoke comments ranging from "outmoded junk," to "museum piece."

But this much-maligned IBM punched-card machine continues to be the workhorse in thousands of efficiently-run computer and unit-record equipment operations.

Indicative of the importance of having a Tab in-house is the fact that so many of these machines are now owned outright by their users, rather than being rented or leased.

Alphanumeric IBM 402s, 403s, 407s, or Numeric 419 Tabs are located in virtually every business community; and, even though new ones are no longer being made, rebuilt units are continuously being installed.

Use For Rush Job

For rush jobs, as well as other important tasks, the Arizona Bank of Phoenix, with 45 branch offices, recently purchased a used IBM 403 from CEI to replace a similar system that it had been renting for about 10 years.

Robert Padian, the bank's assistant vice-president for computer operations, described the move as "a good investment for a minimum price," in this case only \$4,000 for the 403.

"When an 'emergency' run-off is called for," Padian explained, "normal activity can just stop dead in a Tab-less computer room. For such crises, a Tab can be most useful in freeing expensive EDP equipment to carry on

Harvey N. Berlent, 32-year-old president of The Computer Exchange, Inc., of New York, gained broad experience in the computer industry as a consultant with The Diebold Group, Inc., and as a systems engineer with IBM.

He became associated with CEI at its inception in 1966, and has guided the organization from a privately owned company to a public corporation.

its intended role. In this way, our Tab complements our 1401 and 360/30 systems.

"During the past several years, the Arizona Bank has been converting programs in its branches to the main system. We have used the Tab equipment as a 'holder' for these programs during the transition period," Padian said.

Accounts and Customers

The bank also uses its Tab for verifying accounts and customer services as well as for income-expense breakdowns. In addition, officials have found that they can use this equipment for the bank's own operational analysis and programming improvement.

A remarkably wide array of used Tabs is currently available, ranging from fully "loaded" machines with special-purpose features and RPQ devices, to slower-speed, limited-component, IBM Series 50 versions. But in all cases, the result is to give management its required printouts of reports, invoices, payroll checks, etc., accurately, economically, and on time.

Why do so many profit-making companies which have deeply committed themselves to highly sophisticated, long-term, third-generation EDP outlays still keep Tab machines around?

For efficiency and economy. As many sophisticated users (especially those with card-system computers) have found, apparent dollar savings realized from the disposal of an "obsolete" Tab system may turn out to be of the "penny-wise and pound-foolish" variety.

For one thing, costly and time-consuming EDP printout reruns inevitably keep cropping up in every computer room. Management eventually discovers how every rerun expensively ties up the whole EDP system.

Human Errors

What's worse is that in most cases, the real cause of the rerun is not computer error, but clerical, programming, coding, or other human mistakes that

take place long before the actual printout phase of the operation ever begins.

No matter what the cause, the result is a money-wasting mountain of useless computer paper printout that has to be completely redone.

Management had been initially convinced that higher-speed EDP printers would relegate the Tab to oblivion. But computer "pros," faced with rerun problems, have quickly learned the advantages of anticipating such situations. By building their systems around those specific chances of possible printout error, and by including an inexpensive Tab in the installation, the inevitable errors are handled with ease.

In short, the Tab has now become a preliminary control tool, allowing only "in-balance" information to enter the computer system. This extra control goes a long way toward eliminating "Gigo" (garbage in-garbage out).

Less Expensive

Money is the second factor which has brought "obsolete" Tabs back into the EDP picture.

Purchasing an IBM Tab, from CEI for example, makes it decidedly less expensive to own one than to rent one. For example, a full-capacity 402 Tab (model A-1), protected by an IBM monthly maintenance agreement, can be purchased outright for the same amount of money — including mainte-

nance charges — than it costs to rent the same machine and model for just one year, even at leasing-company discount rentals.

The purchase "pay-out" time for full-capacity 406s and 403s also works out favorably for the Tab buyer, compared to renting.

What's more, when certain cost-accounting items such as taxes, ownership of an asset, residual value, and depreciation are also taken into consideration, the additional advantages of outright Tab ownership begin to have an ever stronger impact on corporate EDP budgets.

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Harvey N. Berlent

Seven IBM Employees Named Fellows for Five Years

NEW YORK — Seven IBM employees were named IBM Fellows last week. In this role they are free to pursue professional objectives of their own choosing and to act as consultants to scientists and engineers in the company, an IBM spokesman said.

The Fellows, appointed for a five-year period by IBM Chairman Thomas J. Watson, Jr., are selected on the basis of significant contributions to the business.

The seven are:

E. Alan Brown of Los Gatos, Calif., who designed the high-speed magnetic drum and adjustable magnetic heads used on the IBM 650 magnetic drum data processing machine.

Dr. Herman H. Goldstine of Yorktown Heights, N.Y., who, in collaboration with Prof. John von Neuman at the Institute for Advanced Study, designed and built a digital computer from which many concepts became prototypes for almost all the machines that have been built since.

Dr. Harwood G. Kolsky of Palo Alto, Calif., who pioneered in the architectural design of very large-scale computers.

Dr. Rolf W. Landauer of Yorktown Heights, N.Y., who contributed to a number of IBM's solid-state technologies.

Charles E. Owen of Hursley, England. As a result of his work, the concepts of microprogramming and read-only storage were introduced to the IBM product line.

Dr. Jacob Riseman of East Fishkill, N.Y., who played a large

role in the development of magnetic thin-film devices and Solid Logic Technology (SLT), basic circuitry of IBM's System/360.

Dr. Wouter Vanderkulk of Owego, N.Y., who has led a number of major IBM mathematical analysis projects in the fields of acoustics, optics, seismology, and oceanography.

T. Vincent Learson, president IBM; Emanuel R. Piore, vice president and chief scientist; and Jerrier A. Haddad, vice president of engineering, programming and technology, made the presenta-

tions at the company's recognition dinner in the Plaza Hotel.

The new Fellows were recognized at the dinner along with 85 IBM employees who received outstanding invention or contribution awards last year. The total amount of IBM invention and contribution awards presented in 1968 was in excess of \$1.3 million.

Most Hospitals to Use Time-Share In Ten Years

WELLESLEY HILLS, Mass. — About 75% of the hospitals in 1980 will be sharing time on central computing facilities, according to a study by Honeywell's Electronic Data Processing Division. Today's rate, said James B. Turner, hospital industry manager, is about 5%.

He said the survey showed that of an estimated 7,200 hospitals in existence today, "less than 10% are considered large enough to support their own full-scale computer systems and staffs."

"Hospitals, more than any other business, have a life-and-death need for processing large amounts of information," Turner said. "Therefore computers must become an essential part of the process. But to support this need, the only feasible economic way to automate hospital tasks is through multi-hospital computer-sharing systems."

"Computer-sharing techniques can be an important curb against rising costs for medical services," he added.

The survey covered hospital business areas, research, health insurance, and clinical laboratory systems, including patient monitoring. The figures, Turner said, reflected the projected dollar volume of computer equipment that will be in use by 1980.

Overseas Press Club Uses Computer for Vote Results

NEW YORK — Computer communications have been employed by the Overseas Press Club of America to instantly indicate the winners in the group's annual election of the board of governors.

Using an RCA Videocomp typesetter to compose the official ballot electronically, and an RCA Spectra 70/46 time-sharing computer to record and display the final election tallies, the OPC immediately was able to identify the seven winners from among 13 active candidates, and one winner from among four associate candidates.

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GENERAL ELECTRIC



Dad Comes Out of Retirement; Works As Programmer for Son

By Robert Morrisette
Special to Computerworld

PALO ALTO, Calif. — Father and son combinations are not too common in the computer business, since the programming profession is only about 20 years old.

But rarer still is a father-son relationship in which the father trains himself in the computer field and then goes to work for his son.

The father is Frank Rowe, 62. He began his career in the computer field just two years ago, after retiring from the construction industry in which he had been an estimator and office manager.

The son is Guy Rowe, 31, vice-president of the Engineering Systems Division of Computer Time-Sharing Corp. (CTC).

Retired — and Bored

It all started when Guy learned that his father, then a Canadian resident, was bored with retirement. As a lark, he sent Frank a series of three IBM courses to give him something to do.

To Guy's amazement, the elder Rowe finished the courses in

three weeks, normally a three-month task. He followed this performance with the completion of two more courses and training in programming languages at an IBM education center.

Guy realized that his father had an aptitude for data processing and invited him to move to California and help with the work at Systems Analysis, Inc., which later became a division of CTC.

Frank Rowe accepted the challenge and, at the age of 61, began a career in computers.

Became a Supervisor

He first worked under his son on Cobol projects and learned

the operation of several computers. He did so well that soon he was supervising the division's operations.

Guy believes that his father's success is due to his extensive technical background in the construction industry, including scheduling and cost projections.

Frank believes that from his experience, he has learned that older minds can be educated in new fields.

Guy says that his father's success makes him feel that there must be thousands of other technically trained older persons, not now in the work force, that are overlooked in the present search for data processing manpower.



Newcomer to computer field is Frank Rowe, left, who works for his son, Guy Rowe, vice-president of the Engineering Systems Division of Computer Time-Sharing Corp. in Palo Alto, Calif. The elder Rowe began his new career just two years ago.

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Educational Expansion Program Formed By Men's Retail Trade Group and NCR

WASHINGTON, D.C. — A large (3,300 member) trade association known as Menswear Retailers of America has instituted an educational-expansion program in conjunction with National Cash Register to inform its members in the EDP area.

An estimated 100 MRA stores with existing EDP service contracts with NCR are expected to form the nucleus of charter members for the program.

The program, developed after a year-long study by MRA's Financial and Operations Group, represents the first such program to be instituted by the industry.

Chairman of the group is Karl Dorzback, Jr. Philip J. Keho,

manager of the Financial and Operations Group at MRA, will be responsible for management and further development of the group EDP program.

The basic systems will be designed and implemented. The first, DPC I, is designed to be economically practical and to fit the needs of smaller stores or those requiring limited service. The second, DPC II, is intended for larger stores and offers a more sophisticated array of reports and functions.

Under the program, over 30 reports developed from the store's retail register tapes and other input directly from the store will be offered to MRA

members. The data will be processed in one of the NCR centers across the country. Participation in the program will not, according to NCR, involve the stores in any additional expense for basic EDP service.

The society feels that the main advantages to this approach lie in the areas where different stores can combine resources and share the benefits. A consultant will be available to all participating stores, intragroup analysis of results will be possible immediately, regional workshops and seminars will improve performance, and the system development costs can be distributed among several members.



COMPUTERWORLD

education

Tape, Disk Storage Still Costs Libraries Too Much

BOSTON — It looks like libraries will still have books in them for some time to come. The cost of putting books on tape or disk is still astronomically high, according to William Locke, director of libraries at MIT.

This subject was discussed at the Spring Joint Computer Conference.

According to Locke, it costs 20 cents a year to keep a book on

the shelf, but it would cost \$74.70 per year to store a book in off-line tape storage and \$2,370 to store it on-line on a disk.

Computers are being used for on-line catalogs, but the cost is high. Locke estimates that costs jump 200 times when a catalog is put on-line, and that it would cost \$600,000 just to maintain the catalog of two million books at MIT.

But on-line catalogs are being used. Howard W. Dillion of Harvard described the Symbiosis system (system for medical and biological sciences information searching) currently being implemented by the State University of New York. The system uses an IBM 360/40 and contains several catalogs of book and article titles.

Current Activity

The Library of Congress is already active in this area. Mrs. Henriette D. Avram discussed Project Marc (machine-readable cataloging), for which the information about new books acquired by the Library of Congress is put on tape and distributed to other libraries, much in the way the Library of Congress distributes the traditional catalog cards. The libraries can use this tape to make up their own cards, book pockets, etc.

Mrs. Avram stressed, "Cataloging itself is not amenable to computerization. It is an intellectual exercise." Even preparing catalog cards is a problem. One difficulty is the character set required.

But so far, the primary library use of computers is in the area of acquisitions and making up catalog cards. Even here, it may cost more — 10% more according to Locke. But Locke also points out that simple problems, such as a shortage of typists, are forcing MIT to use computers in this area.

Computers Oversold?

There was also some discussion about the relationship between library people and computer people. Mrs. Avram, a computer professional who has been connected with libraries for only four years, charged that the "capabilities of computers have been oversold to librarians" and that librarians must learn about computers in order to give guidance to computer people who begin to work in the field.

A questioner from the audience noted that programmers barge in and try to set up totally new systems. "It is disastrous for programmers to try to reinvent the wheel, totally ignorant of library tradition," he said.

On the other side, one questioner asked that library people adapt to computers. He said that using computers on library systems as they are now, is like "replacing a bus with an airplane and then telling the pilot to follow Route 40."

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Proxmire Proposes Law to Regulate Credit Bureaus

WASHINGTON, D.C. — A bill to regulate the credit-reporting industry has been proposed by Sen. William Proxmire, who indicated that he was particularly concerned about the entry of computers into the field.

The bill, according to Proxmire, would

"enable consumers to protect themselves against arbitrary, erroneous, and malicious credit information." Hearings on the bill are being conducted by the Subcommittee on Financial Institutions of the Senate Banking and Currency Committee.

Bill Called Too Weak

Virginia H. Knauer, special assistant to the President for consumer affairs, testified in support of the bill "in principle," but stated that, as currently written, it did not adequately protect the consumer. In proposing the bill, Proxmire warned:

"A few years ago, the executive branch proposed the establishment of a national data bank with personal information on every U.S. citizen. The 'big brother is watching' overtones . . . led to its quick abandonment. Yet we are building roughly the same type of data bank under private auspices, but with none of the public safeguards."

Credit-File Errors

Errors in credit files are one of Proxmire's major concerns. "With the growing trend toward computerization, the incidence of computer errors is on the increase. Such errors are particularly prevalent during periods of conversion when all of the 'bugs' in the new computer system have not yet been worked out. For example, a California credit-reporting agency mistakenly labeled a whole drawer of good credit risks as bad credit risks."

Proxmire also saw another difficulty caused by computers: "Because of the increased computerization and standardization of credit bureau files, all of the relevant information is not always reflected in a person's file. For example, one housewife had difficulty obtaining credit. She finally discovered the credit bureau had categorized her as a 'slow payer' despite the fact that the credit manager at the store involved was fully aware of, and had agreed to, the extenuating circumstances causing the late payment. However, under the credit bureau's file system, these additional facts were not recorded. The trend toward increased computerized reporting should increase this type of inaccuracy."

Another example cited by Proxmire was the case of a man who missed several auto-loan payments due to a severe in-

British Tea Chests Sorted by Computer

LONDON — They have mated tradition with modern technology in England.

A new tea warehouse recently opened in London by Buchanan's Warehouses is using a system developed by Sortrac of Avonmouth, Bristol, to sort tea chests automatically. The chests are unloaded from ships at the wharf in a random manner.

The system, under the control of a Digital Equipment Corp. PDP-8/I computer, sorts the chests into batches of 168 different types or "breaks." It weighs the chest, arranges them on pallets, and passes the loaded pallets to an automatic pallet conveyor.

jury. "Although the man obtained the specific permission of the lending office to delay the payments," he said, "the computer showed only that the payments were late."

Details of the Bill

According to Proxmire, the bill would require credit-reporting agencies to:

- Provide a reasonable opportunity for an individual to correct inaccurate or misleading information in his file.
- Inform a person if the agency includes in his file a derogatory item based on public record.
- Keep information up to date and destroy obsolete information.
- Limit their information to those items essential to the purpose for which the information is used.
- Be required to assure the confidentiality of the information.
- Not furnish information to govern-

ment agencies, market research firms, and others "who are simply on fishing expeditions."

- Not furnish information for purposes different than those disclosed when it was collected; i.e. credit information could not be given to insurance investigators.

Individual Could Sue

In addition, the bill would require creditors and other firms to tell a person if he is rejected for credit, insurance, employment, etc., based wholly or partly on a credit report. Finally, an individual could sue, for up to \$1,000, a credit-reporting agency that violated the law.

Changes Suggested

Mrs. Knauer said that the bill should be strengthened in some areas:

- Individuals should be able to obtain the contents of their file.
- Individuals should be able to include

explanatory statements in their file if they believe that information in it is inaccurate.

- When an item in a file is corrected, the reporting agency should send a corrected report to everyone who received an erroneous report.

- Specific time limits should be set for keeping information in a file.

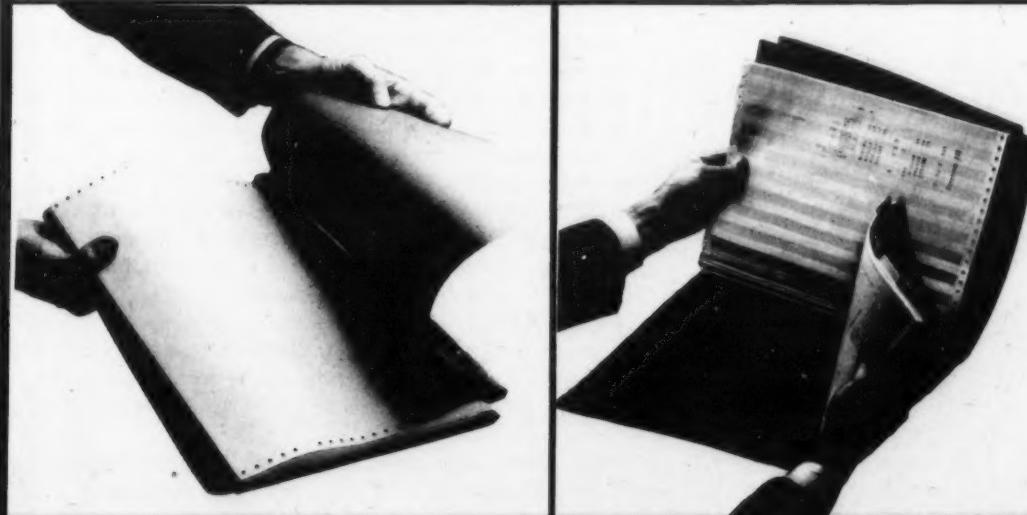
- No limit should be placed on the amount of damages that a court could award to an individual.

Both Proxmire and Mrs. Knauer took note of new guidelines recently set up by the Associated Credit Bureaus (CW, March 19), but both felt that they were insufficient. Proxmire noted that the guidelines were voluntary and were only recommendations. He also said: "Not one single consumer organization participated in the development of the guidelines. This fact alone reveals the basic orientation of the credit-reporting industry."

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Societies

ACM Seminar to Feature Systems Design, Selection

NEW YORK — The Analytic Design of Real-Time Computer Systems is the title of the NYC ACM Professional Development Seminar to be held June 24 at the Summit Hotel on Lexington Ave.

The seminar is directed at those responsible for decisions concerning the design of a real-time computer system in terms of selection and configuration of the hardware, architecture, and implementation of the software.

Speakers will be Dr. Joseph Abate, senior staff consultant at

Computer Applications, Inc., and Sheldon B. Weinberg, senior mathematician at Realtronics, Inc.

Attendance at the seminar is limited to the first 75 registrants.

Registration fee is \$25 for ACM members; \$30 for non-member employees of corporate members; \$35 for nonmembers, and \$12.50 for students.

To register, send your name, address, and payment to: Randall Rustin, 560 Riverside Drive, New York, N.Y. 10027.

Tech Report Survey Released By Codasyl Systems Committee

CAMDEN, N.J. — The Codasyl Systems Committee has released a 375-page technical report entitled "A Survey of Generalized Data Base Management Systems."

The aim of the committee in carrying out this survey has been to find a common basis for describing such systems and to demonstrate its usability, according to a committeeman.

The report is being made available to the computing community, and it is hoped that it will be used as a basis for further theoretical and developmental work within Codasyl.

The survey contains a list of the features typically found in a

generalized, data-base management system. For each of the nine systems included in the survey, there is a narrative description of the system in the format and terminology of the feature list.

The Association for Computing Machinery is distributing the report at \$7.50 per copy. Copies may be obtained from ACM Publication Dept., 1133 Avenue of the Americas, New York, N.Y. 10036.

New Literature

An illustrated, four-page brochure (GEA-8830) describes the role of NASA's twin GE-53 635 computers. Write General Electric Co., Bldg. 6-207, Schenectady, N.Y. 12305.

An eight-page brochure on the Iddiom Interactive Display system describes how interactive displays facilitate real-time two-way communication between computers and individuals without special EDP training. Bulletin #171, Information Displays, Inc., 333 N. Bedford Road, Mt. Kisco, N.Y. 10549.

A brochure outlining a master programming system used to simplify the implementation of difficult-to-maintain payroll programs is available from Computer Planning Corp., 21515 Hawthorne Blvd., Torrance, Calif. 90503.

A bulletin describing the computer systems support services is now available by writing for Bulletin #B-9550, Westinghouse Electric Corp., P.O. Box 868, Pittsburgh, Pa. 15230.

A safe that will store magnetic tapes, disk packs, sensitive cartridges, micro-fiche, and EDP media, and protect them against fire, heat, and moisture, is described in a brochure available from Diebold, Inc., Canton, Ohio, 44702.

A bulletin titled *Computer, Equipment and Forms* that describes how companies make profitable use of small computers and unit record and posting machines is available at a yearly subscription price of \$3.50 from Computer Equipment and Forms Bulletin, Box 457, West Nyack, N.Y. 10994.

A four-page color brochure describing and illustrating the Model 701 disk storage drive is available from Information Storage Systems, Inc., 10435 N. Tantau St., Cupertino, Calif. 95014.

An information manual for the 3M Series F Electron Beam Recorder may be obtained from 3M Co., 3M Center, St. Paul, Minn. 55101.

A selection of standard and special-purpose precision probes used for measuring temperature, total and static pressure, and velocity and flow direction of fluids, gases, and liquids is offered in a color brochure from United Sensor & Control Corp., 85 School St., Watertown, Mass. 02172.

Copy of brochure DNA-100, which describes operation of the computer-based Clinical Laboratory System from Diversified Numeric Applications, is available by writing Midland Associates, Inc., Diversified Numeric Applications, Division of Avnet, Inc., 9801 Logan Ave., South, Minneapolis, Minn. 55431.

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June 11, 1969

Page 15

Payment System Eliminates Invoices, Checks

NEW YORK — A new, freight-remittance system that can eliminate both invoices and checks, sharply reducing the paperwork associated with freight handling, as been developed by the Chase Manhattan Bank.

Under the system, shipping charges are paid by a transfer from the bank account of the shipper to that of the carrier — a concept often expressed as that of the "cashless, checkless society." The transaction is triggered by the initial shipping order, eliminating billing of any sort.

The program, offered as a service by the bank, is known as Computer-Oriented Freight Remittance System (Cofrs). It is expected to eliminate 75% of the paperwork associated with settling freight shipments, according to Peter S. Douglas, the

bank's technical director for transportation.

Bank officials estimated that shippers and carriers had paid over \$150 million last year to process over one billion forms, all of which could be eliminated through the Cofrs approach.

Normal Entry Procedure

The basic approach involves shippers preparing a standard shipping order. Using statutory rate information (established by the ICC) the shipper computes charges for the transaction. The shipping order is then marked

"COFRS" to prevent its going through the normal billing and invoicing procedures.

No Money Changed

The shipper forwards payment information directly to Chase, which then completes the transaction. The bank charges the shipper's account for payments as they come due, and transfers the funds. This process eliminates the check, as well as the invoice.

The bank says that it is expecting most firms employing this service to send information

to the bank in computer-ready form (punched cards, tapes, etc.). It could also be transmitted directly, via telephone lines, to the computer.

According to Douglas, the use of Cofrs effectively reduces, from about 19 to 5, the number of steps in payment of freight charges. John J. McFadden, Chase vice-president, noted that subscribing shippers will be able to use Cofrs for all their outbound, prepaid freight transactions. "Carriers with accounts at Chase can be paid by direct credit," he said,

"others will receive official bank checks."

McFadden pointed out that the savings possible under this system are very real in terms of people, paper, and time. They can be realized immediately. He noted that the new plan is being presented first to the American Trucking Association because "by far the greatest number of freight transactions are motor carrier transactions." Douglas stressed that this service is equally applicable to all types of carriers — air, rail, truck, and ship alike.

System Offers Flexible Method Of Accounting

HARTFORD, Conn. — A new accounts-receivable system, A/R-70, has been released by the Computer Processing Corp. The system, being marketed by the National Software Exchange of Great Neck, N.Y., is claimed to provide the flexibility of either specifying an open-item or balance-forward method of accounting.

Five Reports Generated

The package runs on any S/360 with 32K under either DOS or OS. A/R-70 generates five reports including an edit report, accounts receivable posting, aged trial-balance report, past-due listing, and a customer-status report. Customer statements can be generated either on an open-item basis or on a balance-forward basis, according to National Software Exchange.

Priced at \$16,000, the system comes with documentation, maintenance, installation, and four days of on-site training and support.

Program Prints Letters Two-Up And Saves Time

NEW YORK — A letter-writing program, known as CPL and designed by Mandate Systems, Inc., is now available for \$1,800. The program runs on any S/360 under either DOS or OS.

The output produces two letters simultaneously, side by side, and accepts either 3- and/or 4-line addresses from either cards or tape. Variable information processing for data such as date, salutation, internal name referencing, etc., is included, the company claims.

By producing the letters two-up, the company claims a saving of 50% over other letter-writing packages.



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By time-sharing the data from 60 or more keyboard operators simultaneously, significant savings in data station costs of as much as 50% can be achieved. Costs drop to as low as \$4300 per data station for a typical 60 station system. For large data preparation installations, the time-shared input is the only economical way to go.

Data entered into the LC-720 is processed by a small digital computer and stored on an IBM/

360-compatible magnetic disc that provides the advantages of bulk storage and high speed random access of data. The problems associated with punched card handling or the mounting, pooling, merging and unmounting of magnetic tape reels are eliminated. All data is conveniently and economically stored in an IBM 1316 disc pack for direct high speed input to your modern data processing system. Naturally, an IBM/360-compatible magnetic tape is also provided with the system as standard equipment.

The LC-720 KeyDisc System also offers for the first time, data verification requiring one input pass only through the system, in addition to the normal technique of verification requiring two different operators. Record size is infinitely variable by each operator from 1 to 120 characters long and the system stores a large library of 30 or more different format control programs, all available simultaneously to any and all operators.

LC-720 KeyDisc System

Bring your own data for a demonstration

Logic Corporation invites you to see an operating demonstration of the LC-720 KeyDisc System at the company's premises. Bring your own original data and Logic will provide a reel of magnetic tape of the output of your data from the LC-720 for later printout at your own computer facility.

To arrange for a demonstration, contact Gary Tischler, Director of Marketing (201) 334-3713

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'Resque' Aids Market Research

DALLAS — Resque, a program to provide analysis and tabulation of market research questionnaires, is now available from the Data Link Division of University Computing Corp.

Resque was developed at Hayes Statistical, a subdivision of Data Link, and consists of a sequence of subprograms, each performing some small part of a total analysis package. One of the subprograms, Numeric Progression, provides frequency distribution reports including cell counts (unit breakdowns by category) and percentage cross-totals.

Other parts of the system in-

Edit System Said to Cut Programming

NEW YORK — Data Check Express, a new data correction and file-management system, can provide simple, rapid file updates, merging, and data management for S/360 either OS or DOS, according to its developer, Express Software Systems, Inc.

The company claims to have developed a new editing language that can "greatly simplify the problems of data editing and control." According to the designers, an experienced programmer can become completely familiar with the language and the package in two hours.

A program used as an example showed a fifty-page Cobol program written in less than five pages, using DCE. This 85% reduction in coding alone, it is felt, could justify the existence of such a package.

The facilities included in the package are: checking and correcting any format of data, checking data interrelationships, data-file restructuring, and standardized editing techniques.

Requiring 65K of memory and two to six devices (either tape or disk), DCE, which is written in Fortran IV, can operate in almost any S/360 environment.

The package sells for \$8,000 until June 30, 1969, this price including all present and future modules. After that date, the system will be sold module-by-module, with each module priced separately.

Express Software Systems is at 500 Park Ave. here.

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clude a rating scale, which measures degrees of like or dislike for a given product through numeric ratings, an 80-column count routine that provides absolute counts based on columns punched in market survey cards, and a standard correlation routine that provides marginal counts and cross-tabulations by columns and rows for survey analysis.

According to O.F. Shinn, company marketing vice-president, "Resque is the most efficient program yet devised for this aspect of market research activities."

Resque is available either as a service operation or as a purchasable package. The purchase price is subject to negotiation, depending on the desired modules.

The company claims that several major industries are already using Resque including airlines, cosmetic suppliers, mail-order houses, and automobile companies. Several market research firms are regular subscribers, the company pointed out.

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Page 17



Dr. Paul Ross demonstrates a robot stockbroker trained to recognize and act on an individual's voice patterns.

RCA Demonstrates Robot Stockbroker EDP System

CHICAGO — A robot stockbroker that literally "does what it's told" was demonstrated recently by RCA.

The broker is really an experimental data processing system comprised of a time-sharing computer, a TV data terminal, and special electronic circuits that can analyze human speech.

In its demonstration form, according to its chief developer, Dr. Paul Ross of RCA Laboratories, the system has been supplied with a limited Wall Street vocabulary and can be trained to recognize the voice of any stockholder, and to obey his spoken commands.

Typical of such commands, he said, would be a customer request that the system display a listing of his current holdings, that it buy or sell selected shares, or, after such transactions, that it update and display his revised portfolio.

Keeps Stockholder Honest

"The system will even keep the stockholder honest by refusing to carry out an illegal command such as might occur if he asks it to sell more stock than he has," Dr. Ross indicated.

In that case, he said, the program to be used in the demonstration causes the system to generate a warning on the TV data terminal that reads, "Selling short is a no-no!"

Though other computer systems that respond to vocal commands have been demonstrated before, Dr. Ross noted they have all been dedicated systems (non-time-sharing), have been able to use only one vocabulary, and have had to process in excess of 3,000 bits of information per second to do their job.

By contrast, he said, the experimental RCA system shares time on an RCA Spectra 70/45 computer simultaneously with 31 other users; it can be adapted to use any vocabulary arbitrarily, from the vernacular of the stock exchange to the language of space flight; and it requires

only 120 bits of information per second to perform its tasks.

He called these improvements highly significant, and credited their realization to the development of advanced software programs by Drs. James Miller and Charles Wine, also of RCA Laboratories.

Robot Operation

Dr. Ross described the operation of the automatic stockbroker as follows:

First, a vocabulary of some 28 words of importance in the stock field is typed into the memory of the time-sharing computer by means of a standard data terminal keyboard.

Starting with this as a base, the computer now goes into a training mode, and through its video display, asks the user to say each word into a microphone. The microphone, in turn, is linked to circuits that analyze each word spoken according to a dozen critical acoustical features which are converted to digital electronic patterns and sent to the computer's memory for storage.

This process is repeated an average of three times for each word, or until the computer is satisfied that it can recognize the word when the user says it.

After that, the computer is switched to the automatic mode and is ready to accept verbal instructions from its trainer.

KPA Gets New Name

LARGE, Pa. — Shareholders of KPA Computer Techniques, Inc., have approved a name change to KPA Nuclear, Inc. at the company's annual meeting.

The change does not affect the company's wholly owned subsidiary, KPA Time-Sharing, Inc., which provides computer time-sharing and software services from four offices in western Pennsylvania and Ohio.

Shareholders also authorized an increase in common shares from 1 million to 2 million, and the creation of 1 million shares of \$1.00 par value preferred stock.

On-Line Bank Terminal Market Estimated at Over \$300 Million

MIAMI BEACH, Fla. — A potential market for over 40,000 new, on-line computer terminals is opening up in the nation's savings and loan and mutual savings bank business, Bryant W. Cannon, vice-president, Great Western Financial Corp., has reported. This market involves sales in excess of \$300,000,000.

These new terminals will enable tellers and administrative personnel at remote locations to utilize management and accounting data stored centrally in advanced computer systems. This will result in faster service to customers and more sophisticated tools for management of savings institutions, according to Cannon.

Cannon, chairman of the Online Equipment and Communications Specifications Committee of the National Society of Controllers & Financial Officers of Savings Institutions, an affiliate of the U.S. Savings & Loan League, reported to the society that for the first time, computer terminals designed according to prepared savings business specifications are now on the market.

The savings and loan executive said that the new terminals came about as a result of close cooperation between computer manufacturers and both savings and loan and mutual savings bank associations.

Cannon explained that a great many of the thrift institutions are using highly sophisticated "third-generation" computers or are using computer service bureaus with similar equipment.

"The problem was," he said, "that the only thing the manufacturers were offering in the way of terminals suitable for financial institution use were of the 'first generation.'"

Obviously, the sophisticated new management information systems under development in the savings business require less expensive new terminals with increased function, he added.

The problem was solved by the committee preparing a list of specifications stating exactly what was required of the new specialized terminals. These specifications were given to the major computer manufacturers who indicated a willingness to participate in the project. An objective of two years was set by the committee for the manufacturers to respond with equipment meeting the specifications.

Cannon said that naturally there was some reluctance on the part of the manufacturers to develop an entirely new terminal system, since they continued to find success in marketing the old "first-generation" terminal system.

"The terminals being marketed with third-generation computers simply were not sufficient for our needs," Cannon stated. "They were too expensive, generally made a rather primitive use of communication lines, generally didn't have alphabetic ca-

bility, and were otherwise limited in function."

Cannon said that the reluctance on the manufacturers' part to develop something new was quickly dispelled when the market potential was studied.

"Between the savings and loan associations and the mutual savings banks, there is a need for over 40,000 of the new terminals," Cannon said. "This is a market in excess of \$300,000,000, and with the way the thrift-institution business is turning to the new on-line systems for the better service they provide, it is conceivable that the terminal business will be more profitable than the computer business."

The computer manufacturers participating in the project are Burroughs, Bunker-Ramo, IBM, NCR, and Olivetti.

"After two years, the results are that thrift institutions have three lines of new-generation computers from which to choose. These are the Burroughs TC-500 and TC-700, the IBM 2980, and the Olivetti 3490-B

and 380," Cannon said. "While NCR has not announced its new terminal yet, I expect them to before long."

The committee chairman explained that cost was another factor stressed in the design of the new computer terminals. He said that the pricing objectives include the terminal, its allocated share of the control unit function, and the associated data set.

"Based on these factors," he said, "the large volume of sales for this equipment would justify a sales price somewhere in the \$5,000 to \$7,500 range. While initial prices of some of the new terminals probably will be higher than this, we confidently expect them to drop to the goal level once the volume, and the competition, picks up."

Cannon said that while the new type of terminals was pioneered by the thrift institution business, they are also adaptable to many other businesses such as commercial banks and consumer credit companies.

7% 'Flurry of Concern' Hard to Understand'

WASHINGTON, D.C. — "The flurry of concern" about the impact of repealing the 7% investment tax credit is "hard to understand," according to Robert D. Holland, Computer Leasing Co. president.

"The computer-leasing business, one of the fastest growing in America, was certainly not developed because of the happenstance of an investment tax credit, nor is the soundness of the business related to it."

CLC, for example, has customarily "used less than half the available tax credit, and the combination of carry-forward and growth of the business will phase it out without adverse effect," Holland said.

"It's doing more business that makes more earnings, and any leasing company impeded by loss of the tax credit must be standing still," Holland added.

Computer Leasing Co. showed substantially increased revenues and net income for the first quarter of 1969 over the like quarter last year, Holland reported.

CLC net income amounted to \$1,106,312, or 21 cents per share, on 5,574,397 average shares outstanding including residual securities. Revenues for the three-month period were \$12,063,470.

For comparison, net income for the 1968 first quarter, restated to reflect companies acquired in 1968 on a pooling-of-interest basis, was \$737,526, or 15 cents per share, on a restated average of 5,355,693 shares. Revenues for the 1968 period,

also on a restated basis, were \$5,979,489.

Holland noted that "the size of the potential market for leasing computers continued to grow faster than leasing companies are accommodating it, so the opportunity remains large for CLC to be selective in deploying its funds and to specialize in large-scale systems."

DEC Votes Stock Split

MAYNARD, Mass. — Digital Equipment Corp.'s board of directors has approved a three-to-one stock split.

The record date for the split is May 23, 1969, with the payment date being June 27, 1969.

Management Data Gets Cash For Bryn Mawr Stock

PHILADELPHIA — Management Data Corp. has sold 28,153 shares of the common stock of the Bryn Mawr Trust Co. to the Citizens Bank at the price of \$75.50 per share, or a total of over \$2 million.

MDC's president, Gilbert N. Zitin, stated that following the termination of his company's exchange offer to the shareholders of the Bryn Mawr Trust Co. on Jan. 24, 1969, it had been decided to hold the shares obtained by reason of the exchange offer until a final decision with respect to the matter was reached.

In light of the pending one-bank holding company legislation, MDC decided it would be in its best interests to dispose of its holdings of the Bryn Mawr Trust Co. common stock.

Leasing, Peripherals Stocks Sag

By A.B. Williams
CW Staff Writer

The short week ended May 29 could be known as "the week of the sag." Losses outnumbered gains by 63 to 27, but outside the software sector, only two issues changed by 10% or more. There were few new highs or

lows, but more than one-third of all stocks listed are within 10% of new 1969 lows.

The major sagging group was Leasing, down 4.8% to 88.04, against a March 1, 1968, base of 100. This below-base standing reflects the fact that only two issues on the index still show a gain from base — Leasco, up

87.8%, and Levin-Townsend, up 19.1%.

During the week, 17 leasing stocks lost ground while only three gained. While no issue lost more than 8.4%, the three gainers were equally limited, resulting in a general sag. Eight of the leasing companies are within 10% of 1969 lows, while only one, Continental, is close to a new high.

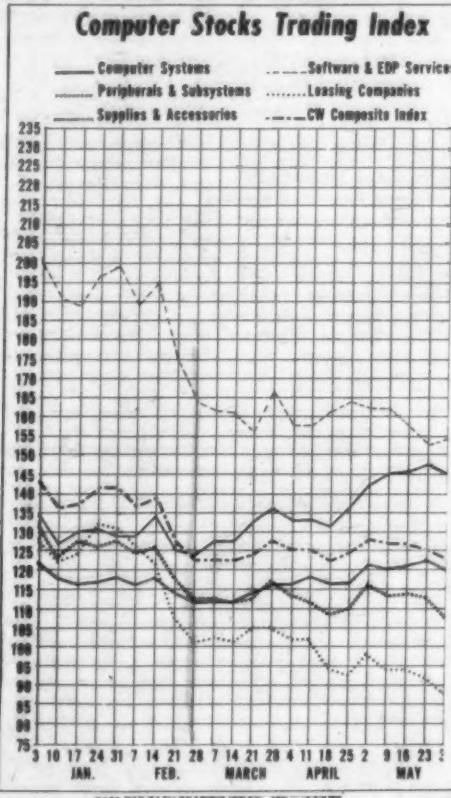
It looks like the group needs a surge of favorable earnings reports or a renewal of speculative fever. The other slide was in the Peripherals sector. Again, changes were narrow; only Photon, down 3-3/4 on the termination of merger talks with Mohawk, and Sanders, losing 5-5/8, broke the 10% barrier. Sanders and Farrington hit new lows.

Unbundling

A number of our nonindustry friends are talking "knowledgeably" about unbundling, and the great salutary effect it will have on the various nonmainframe sectors of the computer market. It may be of great early benefit to some specific companies which have been aiming specialized products directly at IBM.

A general rule may be involved: The larger the company, and the more diverse its involvement, the more planning and shifting will be required.

Unbundling may not be the industry's panacea. IBM isn't about to roll over and play dead. The next year or two should be very interesting.



*This announcement is neither an offer to sell nor a solicitation of an offer to buy any of these securities.
The offering is made only by the Prospectus.*

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Incorporated**

May 28, 1969

COMPUTER STOCKS: TRADING SUMMARY

WEEK ENDED MAY 23, 1969

COMPUTER SYSTEMS				WEEK	WEEK
EXCH	1969 RANGE	CLOSING PRICE	NET CHANGE	% CHANGE	
N	135-121	124 1/4	BURROUGHS CORP	- 4 3/4	-3.68
N	69-48	53 3/4	COLLINS RADIO	+ 1/4	.47
N	159-125	148 5/8	CONTROL DATA CORP	- 3 1/8	-2.86
A	200-136	198	DIGITAL EQUIPMENT	+ 6	3.13
N	25-18	28 7/8	ELECTRONIC ASSOC.	- 1 1/2	-6.78
N	98-85	94 1/4	GENERAL ELECTRIC	- 2 1/8	-2.66
N	95-73	91 3/8	HEWLETT-PACKARD CO	+ 1 3/4	1.95
N	146-107	134 1/2	HONEYWELL INC	+ 2 1/4	1.78
N	334-291	319	IBM	- 8	-2.45
N	139-108	130	NCR	---	---
N	48-41	44	RCA	- 1 1/8	-2.49
N	50-37	37 7/8	RAYTHEON CO	+ 1/4	.66
O	43-32	31 1/2	SCI. CONTROL CORP.	- 1 1/4	-4.55
N	55-44	52 1/8	SPERRY RAND	+ 3/4	-1.42
A	36-26	35 1/4	SYSTEMS ENG. LABS	+ 7/8	2.55

PERIPHERALS & SUBSYSTEMS				WEEK	WEEK
EXCH	1969 RANGE	CLOSING PRICE	NET CHANGE	% CHANGE	
N	82-65	79 1/4	ADDRESSOGRAPH-MULTI	+ 1/8	.16
O	71-24	25	ALPHANUMERIC	---	---
N	44-32	41 7/8	AMPEX CORP	+ 1/4	.68
O	19-14	15	BOLT-BERANEK & NEW	+ 1/4	1.69
N	17-12	13	BUNKER-RAMO	- 3/8	-2.88
A	37-27	31 7/8	CALCOMP	- 1/2	-1.54
O	36-23	31 1/2	COGNITRONICS	---	---
O	16-11	13 1/4	COMPUTER EQUIPMENT	- 1/4	-1.85
A	27-16	17	DATA PRODUCTS CORP	- 1 1/4	-6.85
O	22-15	15 1/2	DIGITRONICS	- 1/2	-3.13
O	62-46	55	ELECTRON MEMORIES	- 1	-1.79
O	12-18	18 3/4	FABRI-TEX	- 3/4	-6.52
O	37-28	28 1/2	FARRINGTON MFG	- 1	-3.39
O	21-14	18	INFORMATION DIS	+ 1	5.88
A	34-28	24 1/4	MILGO ELECTRONICS	- 1 7/8	-7.18
A	82-59	75 3/4	MOHAWK DATA SCI.	- 1 3/4	-2.26
O	118-54	58	OPTICAL SCANNING	- 1	-1.69
O	29-21	23 1/2	PHOTON	- 3 3/4	-13.76
A	35-27	31 1/4	POTTER INSTRUMENT	- 2 1/8	-6.37
O	76-54	63	RECOGNITION EQUIP	- 2 1/2	-3.82
A	22-18	21 3/4	RIXON ELECTRONICS	+ 1/8	.58
N	61-37	37 1/8	SANDERS ASSOCIATES	- 5 5/8	-13.16
O	85-55	57	SCAN DATA	- 1	-1.72
O	36-22	24	TALLY CORP.	- 1 1/2	-5.88
N	275-241	274 1/2	XEROX CORP	+ 3 1/2	1.29

SUPPLIES & ACCESSORIES				WEEK	WEEK
EXCH	1969 RANGE	CLOSING PRICE	NET CHANGE	% CHANGE	
O	47-37	38 3/8	ENNIS BUS. FORMS	- 1	-2.54
N	89-65	86	MEMOREX	- 2 1/2	-2.82
N	112-94	97 1/4	3M COMPANY	- 2 5/8	-2.39
O	37-29	35 1/8	MOORE BUS FORMS	- 3/4	-2.89
N	46-36	42 1/4	NASHUA CORP.	+ 1 1/4	3.85
O	48-36	38 1/2	REYNOLDS & REYNOLD	- 2 1/2	-6.16
O	31-23	29 3/4	STANDARD REGISTER	- 1 1/2	-4.86
N	36-28	32 1/2	UARCO	+ 1/4	.78
A	28-14	16 5/8	WABASH MAGNETICS	- 1/4	-1.48
O	34-29	32 1/4	WALLACE BUS FORMS	---	---

SOFTWARE & EDV SERVICES				WEEK	WEEK
EXCH	1969 RANGE	CLOSING PRICE	NET CHANGE	% CHANGE	
O	14-7	8 3/4	ADVANCED COMP TECH	- 1 1/4	-12.58
O	39-31	39 1/2	APPLIED DATA RES	---	---
O	19-7	9 3/4	ARIES	+ 2	25.81
A	83-63	81 7/8	AUTOMATIC DATA PRC	+ 1 5/8	2.82
O	13-7	8 1/2	AUTO SCIENCES	+ 1/2	6.25
O	17-18	11 3/4	BRANDON APPL SYS	+ 1/4	2.17
A	21-14	15 1/2	COMPUTER APPL	- 3/8	-2.36
O	16-9	9 1/2	COMPUTER ENVIRON	- 1	-9.52
O	47-38	38	COMPUTER NETWORK	---	---
N	75-49	78 1/4	COMPUTER SCIENCES	- 1 3/4	-2.43
O	48-23	24	COMPUTER USAGE	- 1	-4.88
O	56-37	51	COMPUTING & SOFT	+ 1/4	.49
O	24-13	14	DATAMATION SERVICE	---	---
O	17-11	11 1/2	DATABAB	---	---
O	15-7	7 1/4	DIGITEK	- 3/4	-9.38
A	38-29	28 1/4	ELECT COMP PROG	- 5 1/8	-18.72
O	38-28	29	INFORMATICS	---	---
O	19-5	5	MATRIX CORP.	- 2	-28.57
O	22-9	10	NAT COMP ANALYSTS	+ 1	11.11
A	33-23	30 3/8	PLANNING RESEARCH	- 1 3/8	-6.43
O	11-8	8	PROGRAMMING & SYS	---	---
O	18-6	8 1/4	SOFTWARE SYSTEMS	+ 3/4	16.00
O	37-13	13	STRATEGIC SYS	- 1	-7.14
O	36-11	30	TBS COMP CENT INC.	- 1/2	-1.64
O	12-6	7 3/4	UNITED DATA CENTER	+ 1/4	3.33
O	155-68	72	UNIVERSITY COMP	- 9	-11.11
O	38-29	38	URS SYSTEMS	- 3/4	-2.41
O	16-12	12 1/2	U.S. TIME-SHARING	---	---

LEASING COMPANIES				WEEK	WEEK
EXCH	1969 RANGE	CLOSING PRICE	NET CHANGE	% CHANGE	
O	45-34	34 1/4	BOOTHE COMPUTER	- 1/	

Contracts

A \$1,257,000 contract to design and develop a Management Information System for U.S. Army real-property resources has been awarded to Planning Research Corp., Los Angeles, by the Defense Supply Services Department of the Army. The year-long project extends Planning Research Corp.'s Project Definition and will involve design and development of an integrated facilities system to be employed as a tool for achieving more effective management of Army facilities, thereby contributing to improved force planning and force readiness.

Computer Services Corp., Southfield, Mich., has been retained by Owens-Corning Fiberglas Corp. to provide data processing services to its Detroit, Chicago, and Indianapolis district offices. Computer Services will be responsible for the data processing activities relating to daily billing, accounts receivable, inventory control, and payroll for all three districts.

Systems & Computer Technology Corp., Warrington, Pa., has been selected by Temple University to develop a "Five Year Mission and Program Plan" for the Institutional Research and Studies Unit of the Office of Research & Program Development. It will provide for a five-year "mission" to enhance institutional planning and decision making through the development of supportive information systems, studies, institutional data banks, and planning models.

General Electric Co. has been contracted by the General Services Administration to furnish and install electronic data processing equipment at the Air Force Headquarters Data Services Center in Washington, D.C. This center provides management information, computing, management science, statistical service, and other data processing support for Air Force Headquarters and the Office of the Secretary of Defense.

A computer program specially designed to process payroll and accounts payable has been developed by U.S. Systems and Software, Inc., Los Angeles, for J.M. Covington Co. of Santa Fe Springs, Calif., a company which operates oil refineries' off-shore drilling rigs.

General Computer Services, Huntsville, Ala., has announced the receipt of a \$180,000 contract from Brown Engineering, a Teledyne company, for computer-support services to be performed during the 12-month period beginning in July, 1969.

The Aeroneutronics Division of Philco-Ford has awarded a contract to U.S. Systems & Software, Inc. to process management data for its Newport Beach and Anaheim facilities. Data is to be processed at Management Computer Services, Corp., Anaheim, Calif., a subsidiary of U.S. Systems & Software.

Trans-Lux Corp., New York, and Ferranti-Packard Limited, Toronto, Canada, have signed an

agreement to codevelop a high-visibility electronic news display for stock brokerage offices. It will be marketed throughout the world, with particular emphasis in the financial field. The new system will operate directly from on-line transmission sources of news media such as Dow Jones, Reuters, etc.

Com-Share, Inc., Ann Arbor, Mich., has received a blanket contract from the U.S. Naval Research Laboratories in the amount of \$50,000 for one year of time-sharing service effective March 1. Under the terms of the contract, Com-Share's time-sharing system will be used for a wide range of activities by some

400 engineering and scientific users. Operations will include Fortran usage for analog and circuit analysis.

Scientific Data Systems, Los Angeles, has received a \$3.3 million contract from the Douglas Aircraft Co., a division of the McDonnell Douglas Corp., to update their flight test data processing facility in Long Beach, Calif. Included in the system are three Sigma 2 computers, a Sigma 7 computer, and five graphic-display terminals (to be controlled by the SDS Sigma 2 computers) that allow man/machine interaction while providing a permanent record of each test flight.

Rixon Approves Merger With United Utilities, Inc.

SILVER SPRING, Md.—Stockholders of Rixon Electronics Inc. have voted approval of an agreement to merge the business of Rixon into United Utilities, Inc., in exchange for common stock of United. The decision was made at a special meeting of stockholders held on May 22 in the offices of the company.

The actual date for consummation of the merger depends on the Internal Revenue Service, which must rule on its tax-free exchange status.

Under the agreement, United will issue 0.8 share of its common stock for each share of Rixon stock outstanding or committed. United common stock is

listed on the New York, Midwest, and Pacific Coast Stock Exchanges.

Rixon stockholders are expected to receive approximately 579,000 shares of United common stock which, at recent market prices, are valued at \$16 million.

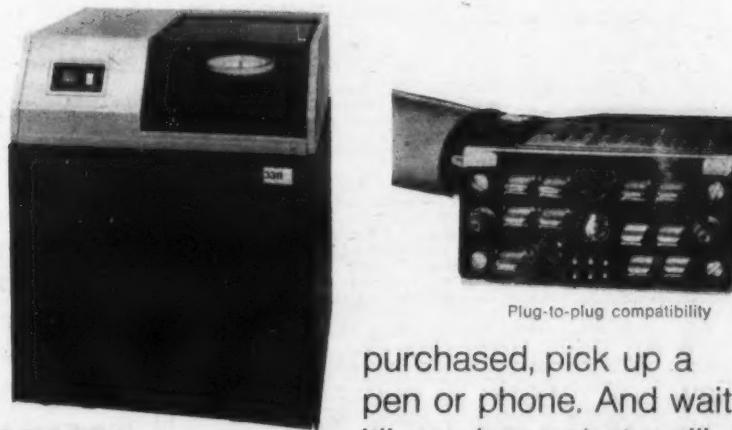
United operates the second largest independent non-Bell telephone system in the United States.

Cash Dividend Declared

The board of directors of Rixon has also declared a special cash dividend of 17 cents a share payable on June 25, 1969, to stockholders of record at the close of business on June 4, 1969.

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Earnings Reports

WANG LABORATORIES, INC.

3 Months Ended March 31

	1969	a1968
Revenue	\$6,216,299	\$4,393,099
Earnings	729,446	533,895
Shr Ernd	.38	.29

9 Months Ended March 31

	1969	\$11,483,979
Revenue	\$15,776,778	\$11,483,979
Earnings	1,676,670	1,294,431

Shr Ernd .87 .70
a—Restated to reflect acquisition of Philip Hankins Inc. on a pooling-of-interest basis in June 1968.

MEMOREX CORP.

3 Months Ended March 31

	1969	1968
Revenue	\$18,152,000	\$11,106,000
Earnings	1,397,000	793,000
Shr Ernd	.38	.22

DATA-CONTROL SYSTEMS

6 Months Ended March 28

	1969	1968
Revenue	\$3,679,500	\$3,362,890
Earnings	50,881	41,026

Shr Ernd .06 .05

VARIAN ASSOCIATES

6 Months Ended March 30

	1969	1968
Revenue	\$89,033,000	\$85,031,000
Earnings	2,433,000	2,811,000

Shr Ernd .37 .44

a—Based on income before special credits of \$1,251,000 (19 cents per share).

DATRONIC RENTAL CORP.

9 Months Ended March 31

	1969	1968
Revenue	\$2,050,383	\$878,775
Earnings	168,290	96,363

Shr Ernd .30 .19

XEROX CORP.

3 Months Ended March 31

	1969	a1968
Revenue	\$245,436,310	\$205,421,813
bEarnings	34,663,029	27,780,536
Shr Ernd	1.54	1.24

a—Restated to include operations of Ginn Co., acquired July 1, 1968.

b—Includes equity in net earnings of Rank Xerox Ltd., amounting to \$7,147,800 in the 1969 period and \$4,986,000 in the 1968 period.

GRAPHIC CONTROLS CORP.

6 Months Ended March 31

	1969	1968
Revenue	\$11,148,263	\$10,217,197
Earnings	359,750	403,851

Shr Ernd .44 .51

SANGAMO ELECTRIC CO.

3 Months Ended March 31

	1969	a1968
Revenue	\$17,292,000	\$18,510,000
Earnings	418,000	867,000

Shr Ernd .15 .32

a—Restated to include acquisitions on a pooling-of-interest basis.

REYNOLDS & REYNOLDS CO.

3 Months Ended March 31

	1969	a1968
Revenue	\$10,925,423	\$9,359,413
Earnings	562,116	581,162

Shr Ernd .25 .26

BUNKER-RAMO CORP.

3 Months Ended March 31

	1969	a1968
Revenue	\$62,054,332	\$57,067,532
Earnings	2,777,932	2,015,194

bShr Ernd .12 .09

a—On a pooling-of-interest basis, reflecting the merger of Bunker-Ramo and Amphenol Corp. in June 1968. b—Based on income before tax credits, on the average common shares adjusted for a residual security basis.

ELECTRONIC DATA SYSTEMS

3 Months Ended March 31

	1969	a1968
Revenue	\$51,124,002	\$2,299,127
Earnings	1,176,915	585,547

Shr Ernd .10 .09

VARIFAB, INC.

Year Ended Dec. 31, 1968

	1968	a1967
Revenue	\$10,254,946	\$5,350,208
Earnings	1,963,120	953,933

Shr Ernd .17 .09

a—Figures not available due to a change in fiscal year.

New Registrations

FEDDER SYSTEMS INSTITUTE, INC., 1206 Goucher Blvd., Baltimore, Md. 21204, a company engaged in the operation of a data processing and computer programming school, filed to register 150,900 shares of common stock and 150,900 common stock purchase warrants to be offered for subscription in units, each consisting of one share and one warrant.

Proceeds, at \$4 per unit, intended for working capital and general purposes, for preparation and marketing of correspondence courses, and for payment of amounts owed to Fedder Data, the parent company. The underwriter is Shendall Securities, Inc., 44 Beaver St., New York, N.Y.

VERNITRON CORP., 477 Madison Ave., New York, N.Y. 10022, a company with sales in precision components, medical products, data sciences, and transportation, filed to register \$20,000,000 of convertible subordinated debentures, due 1989, and 260,000 outstanding shares of common stock, to be sold in units of \$1,000 of debentures and 13 common shares.

Proceeds, at \$1,461.50 per unit maximum, intended to prepay certain indebtedness, and a portion to purchase from Paul Benjamin such number of shares of the company's common stock as will enable the underwriters to offer units consisting of exactly 13 shares per unit. The underwriters are headed by H.L. Fiederman & Co., Inc., 50 Broadway, New York, N.Y., and two other firms.

Computers: What's their future?

The special Review and Forecast issue of *EDP Industry Report*, just published, contains a valuable analysis of the explosive computer industry at a time when there are significant transitions occurring in the EDP market.

Among the issue's features are careful analyses of IBM and the other major computer manufacturers... industry shipment projections through 1975... a presentation of trends to watch for in the industry.

This Review and Forecast issue will bring you up to date on the computer industry.

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